Study Guide for Exam 2

C341 Summer 2015

Important Information:

* 8:00AM-10:00AM, Friday, July 10
* Chemistry 122
* Bring your student ID
* Show up 10-15 minutes early: You will be given assigned seating.
* You may use models, but you may not bring model instructions
* No calculators! No phones!
* Anything else you bring must be in a sealed bag under your chair

Exam Content: Chapters 5-8. All material covered in class, homework, or discussion sections could be on the exam. Some major topics include:

Stereoisomers, enantiomers, chirality, diastereomers, symmetry, R/S, optical activity, meso, Fisher projections, conformationally mobile systems, nomenclature of alkyl halides and alkenes, energy diagrams of substitutions and eliminations, transition states, arrow mechanisms for substitutions and eliminations, leaving groups, nucleophiles, stereochemistry of substitutions and eliminations, carbocation stability, rearrangements, cis/trans, E/Z, regiochemistry of eliminations, antiperiplanar TS, predict Sn1 vs. Sn2, predict products of substitution and elimination reactions, provide reagents for substitution and elimination reactions, determine Sn1/Sn2/E1/E2

Suggestions for studying:

* First, review daily homework and discussion sheets, especially problems you initially missed
* Next, work through additional problems given on last page of syllabus
* More practice:
  1. (12pts) For these reactions, predict whether the reaction will go through an SN1 or SN2 mechanism. Draw the structures of the major substitution product(s) in the box and list the product of the reaction as optically active or optically inactive.



2. (12pts) Do the following compounds have enantiomers and/or diasteriomers? If so, draw an appropriate structure in the box. If not, put an “X” through the entire box.



3. (15 pts) Give the name of this compound, including R/S designations. Draw both chair conformations of this structure. Indicate which one is more stable or if they are of equal stability.



**4.** (16 pts) When 2-butanol is treated with HBr, 2-bromobutane is produced. The mechanism is shown below, and is an acid/base reaction followed by an SN1 mechanism. Answer the questions below based on this mechanism.



A. Fill in the appropriate arrows in the scheme above.

B. Draw an energy diagram for this three-step mechanism with appropriate relative energies. (Assume the reaction is exothermic overall, the carbocation is the least stable intermediate, and the protonated alcohol is less stable than 2-butanol.

C. Based on the mechanism, would the rate go up, down, or remain the same if more Br- were added to the reaction? Explain.

D. Based on the mechanism, if the reaction were to start with (S)-2-butanol, would the bromide product be (R), (S), or a racemic mixture? Explain.

1. (16pts) Give the relationship of each pair of molecules as same, enantiomers, diasteremoers, constitutional isomers, or no relationship. Circle any meso compounds.



1. (9pts) Fill in the missing reactants, reagents, and products of these substitution reactions. (Assume an SN2mechanism.)



7. (6pts) Predict the products of the following E2 eliminations across the C2-C3 bond. What is the stereochemical relationship of the products?



8.(10pts) Draw a mechanism for this reaction including all arrows and intermediates. It will involve two substitution reactions.



The two substitutions in the mechanism above are different from each other. Explain how they are different and why the two parts of the reaction have different mechanisms.

9. (12pts) Provide the reagent(s) needed to cause these transformations.



10. (12pts) Draw a mechanism with all arrows and intermediates for this E1 reaction:



Why is the more substituted (Zaitsev) product formed preferentially? (“The product is more stable” is not a complete answer.)

This reaction is endothermic, but it can still be made to proceed to the right. Explain.